Systems more than the sum of all the parts → A watch is More than glass & gears.

Systems & Models

1.1.1 Outline the concept and characteristics of systems

↳ A system is made of sets of Components that work together & form integrated units → together form a functioning Whole.

↳ Focus on Relationships & Linkages →

↳ can be very large (universe) or very small (cell)

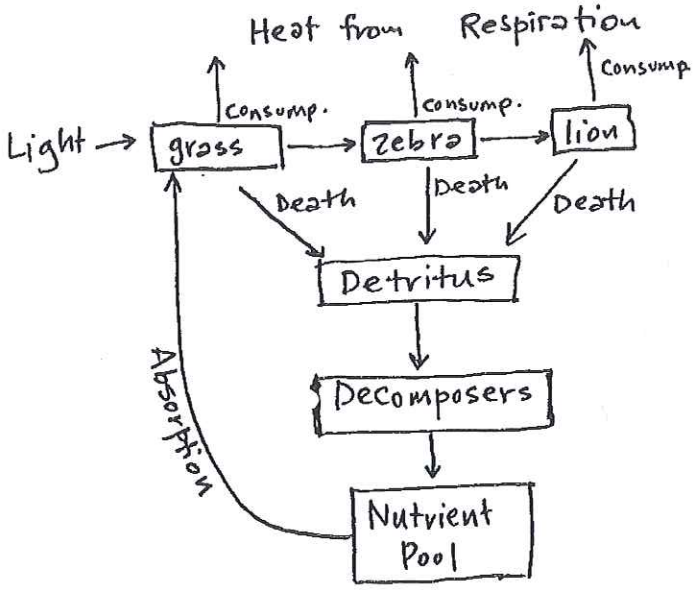
↳ living or nonliving (cell phone), abstract (social norms) OR things like economic or legal systems

How Do You Diagram a System?

* Storages of Matter & Energy = a Box
* Flows (movement in a System) = arrows
* Inputs (into storage) =
* Outputs (out of storage) =
* Boundaries of a/ in a system = a solid line
* processes are ALWAYS labeled!

• For example . . .

a Food Chain is a system:



1.1.3 Define the terms open systems, closed systems, and isolated systems

Open system

exchange matter & Energy w/ Environment

* Most systems!
  - All ecosystems

Closed systems

exchanges ENERGY BUT NOT MATTER with its environment

* VERY RARE!
* Earth as a whole is almost closed (only natural one)

↓

All N, P, C, O, H_2O cycle around BUT Light comes in from Outside & system & Some Returns to space. Heat released back into space.

example - Sealed aquarium or terrarium Biosphere 2

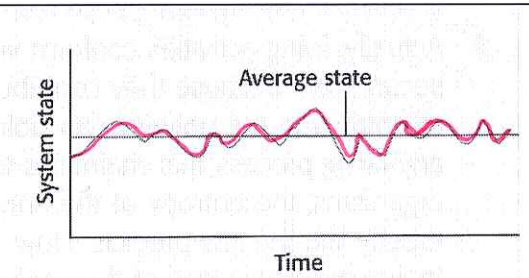
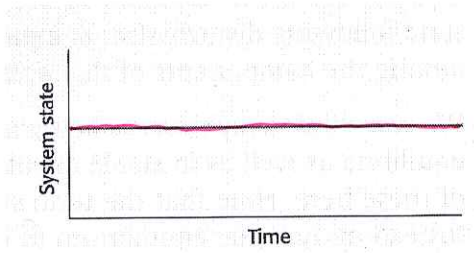
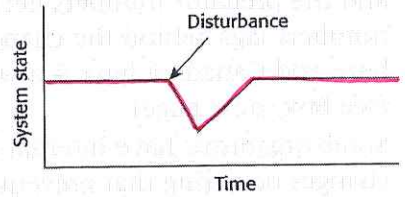
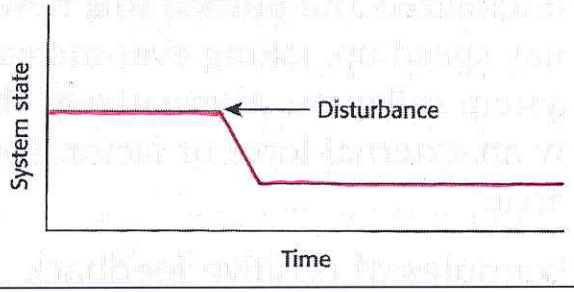
Isolated System

exchanges nothing with its environment

Doesn't exist naturally BUT entire universe is an isolated system.

Gaia Hypothesis - The Earth is an Organism, with its own sustaining Systems

1.1.5 Explain the nature of equilibria

			EXAMPLES
Steady-State Equilibrium	Continuous inputs & outputs of energy & matter; the system remains more or less constant; small short term changes to occur		After a disturbance an ecosystem will go back to the original ecosystem Prey numbers increase which causes predator numbers to increase. The prey numbers drop and so do the predator numbers. It goes back and forth.
Static Equilibrium	No change occurs; does not occur in living systems; when change occurs, a NEW equilibrium is found		A pile of rocks
Stable Equilibrium	A system will return to the same equilibrium after a disturbance		After a disturbance an ecosystem will go back to the original ecosystem
Unstable Equilibrium	After a disturbance, a system will return to a NEW equilibrium		Climate change maybe causing the Earth to find a new equilibrium.

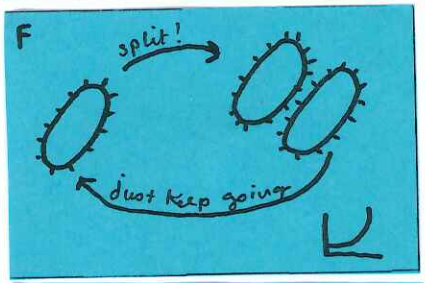
1.1.6 Define and explain the principles of positive feedback and negative feedback

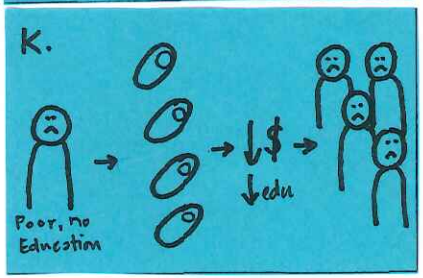
POSITIVE FEEDBACK

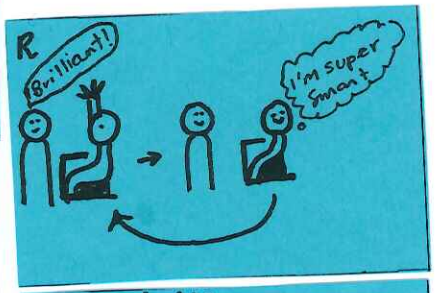
* leads to an increase as the output.

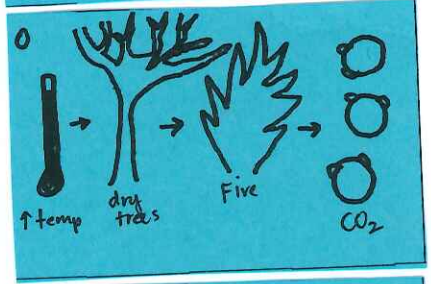
Cause → effect

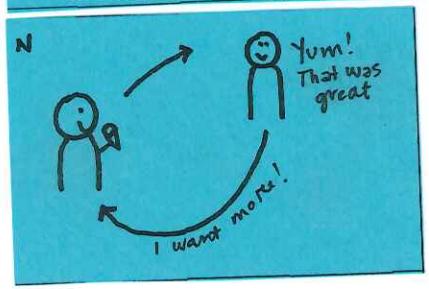
increases









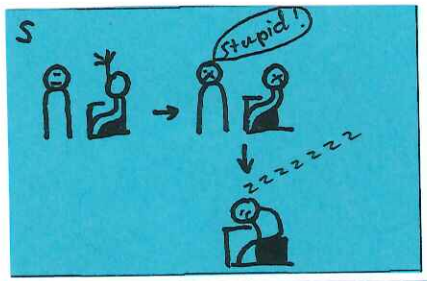


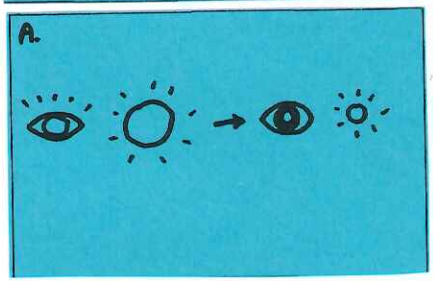
NEGATIVE FEEDBACK

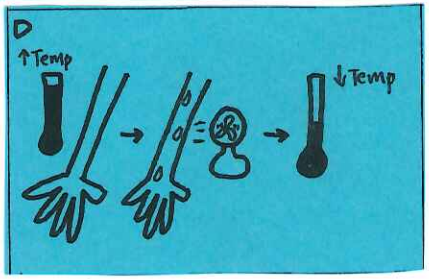
* leads to a decrease in the output
* maintains a system.

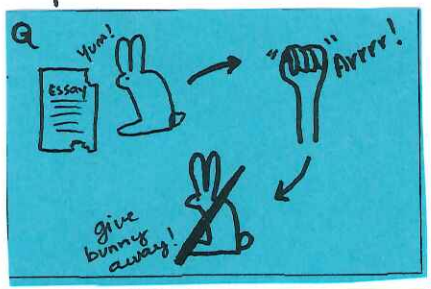
Cause → effect

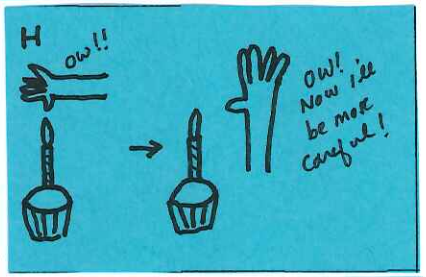
decrease

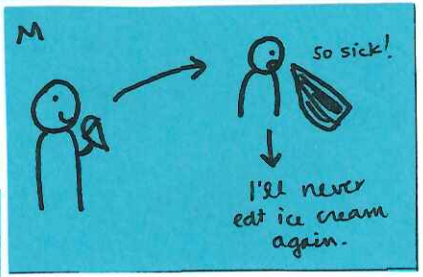




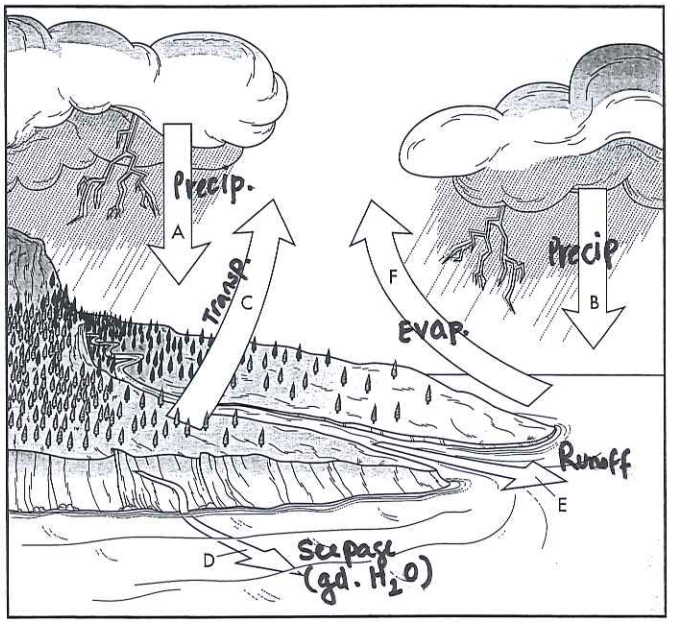




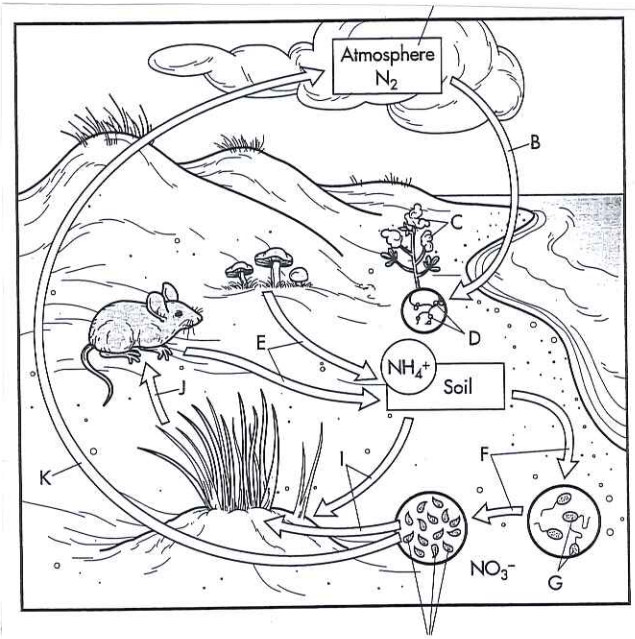




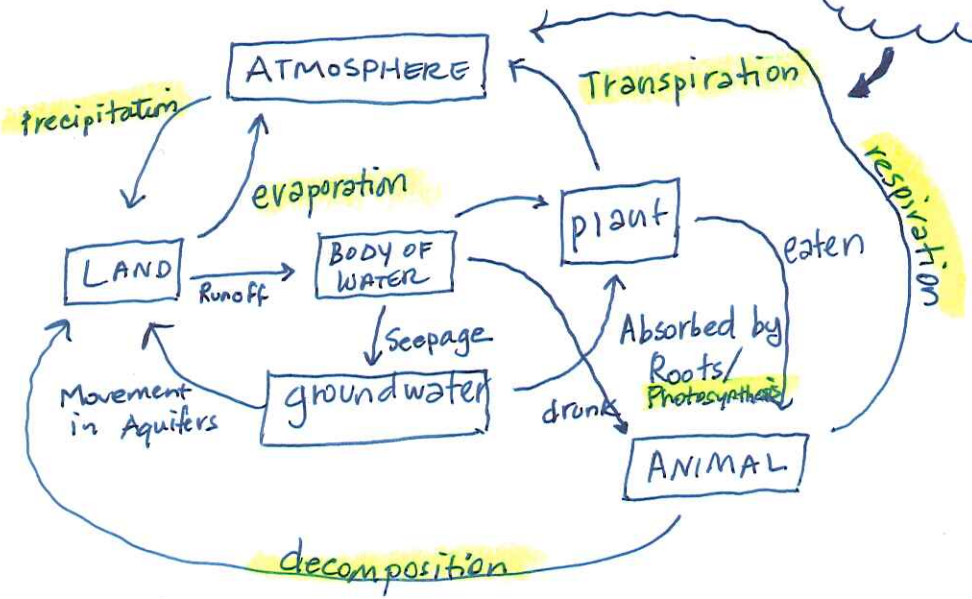
1.1.7 Describe transfer and transformation processes.
1.1.8 Distinguish between flows (inputs and outputs) and storages (stock) in relation to systems



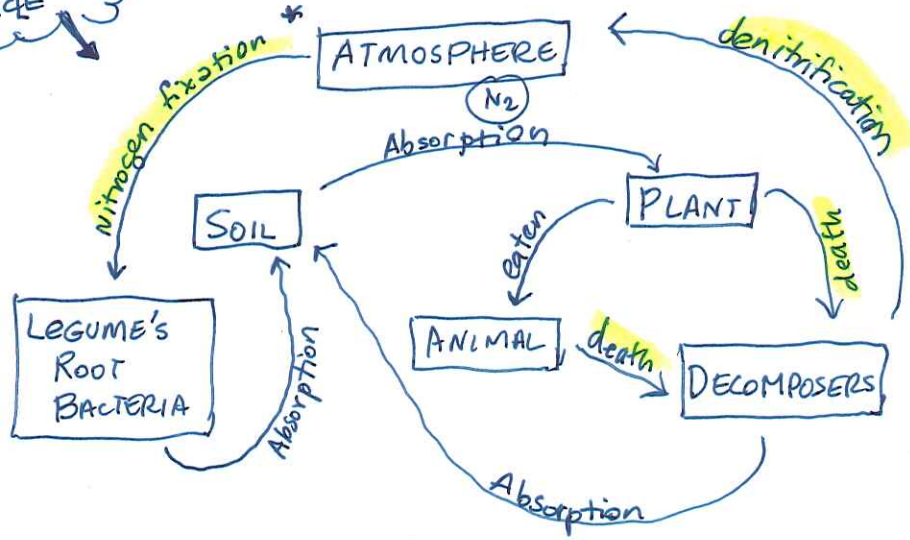
- TRANSFER - Change of location
- TRANSFORMATION - Change of Make-up or State.
- FLOW - The movement into OR out of a Stock.



WATER CYCLE



NITROGEN CYCLE



* Another way to "fix" nitrogen → lightning + nitrogen fixing bacteria